UNITED
NATIONS

E

Economic and Social Council

Distr.
LIMITED

E/CONF.83/L.22
9 January 1991

ENGLISH ONLY

TWELFTH UNITED NATIONS REGIONAL
CARTOGRAPHIC CONFERENCE FOR
ASIA AND THE PACIFIC
Bangkok, 20-28 February 1991
Item 4 of the provisional agenda*

COUNTRY REPORTS ON THE PROGRESS MADE SINCE THE ELEVENTH CONFERENCE

Report on cartographic activities in New Zealand, 1987-1990

Paper submitted by New Zealand

---

* E/CONF.83/1.

91-00692 2001c (E)

/...

READEX
FICHE

INTRODUCTION

This report describes the progress and development of cartography in New Zealand during the period of 1987-1990.

PART 1 : CARTOGRAPHIC ACTIVITIES OF THE NEW ZEALAND DEPARTMENT OF SURVEY AND LAND INFORMATION

The Department of Survey and Land Information (DOSLI) was formed in 1987 when the Department of Lands and Survey was disestablished. This occurred as part of a widespread government restructuring programme designed primarily to separate statutory and regulatory functions from potential and existing revenue earning operations. Central government departments involved in the management of natural resources were also integrated through the restructuring programme to consolidate environmental management, policy development and monitoring. These reforms effectively removed conflicts of interest, allowed operational departments to resemble some aspects of private companies, and introduced a requirement to function according to cost recovery or user pays principles. Several State Owned Enterprises were created, some of which were subsequently sold in the governments State Asset Sales programme while essential service delivery agencies remained within the state sector.

The new department is the principal government civil and military agency for surveys, mapping and land information. The current state sector environment demands the provision of quality products and services by the department. Consequently, DOSLI has focussed on anticipating and responding to government, local authority and private clients needs, technological developments, and the changing requirements of New Zealand society.

These functions provide the basis for :

- secure land tenure and property rights, the use and management of land related resources;

- support for the management and monitoring of the environment, communications, security, social, economic, commercial, administrative and government systems in New Zealand and extended as appropriate to the South Pacific and Antarctic regions;

- assistance in the implementation of the government's policies on indigenous peoples land rights issues as guaranteed by the Treaty of Waitangi, the devolution of service delivery functions to Iwi Authorities, and the transfer of land assets.

There is a responsibility to maintain several major national land record systems that are central to the maintenance of secure land tenure, security

and safety, and for general national and public benefit from the carefully planned and sustainable use of land resources.

These systems include the :

- Survey control and cadastral system;

- Cadastral survey records and mapping;

- Basic topographic mapping.

The department is also required to administer or dispose of Crown land not allocated to a government department or State Owned Enterprise, and provide policy advice to the government on land related issues.

DOSLI is strongly decentralised with 12 district offices and 4 sub offices spread throughout the country. The organisation is structured into four broad groups encompassing data capture, data base applications and Statutory functions. Five specialist operational directorates provide cartographic, photogrammetric, geodetic computing, cadastral data base services and statutory services within this framework. There are a number of supporting activities such as computer support, map distribution, research and development etc.

In addition to DOSLI, two other government agencies carry out mapping and charting activities. These are the Science Mapping Unit of the Department of Scientific and Industrial Research and the Hydrographic Branch of the Royal New Zealand Navy.

The Science Mapping Unit (SMU) is responsible for the preparation and publication of geological, geophysical, oceanographic and soil survey maps as detailed in Part II of this report. Hydrographic survey and charting activities are described in Part III.

Mention was made in the last report of the mapping activities of the New Zealand Forest Service. That department ceased to exist in 1987 and its functions were taken up by other organisations including DOSLI. Some forest mapping is still carried out in a limited form but the majority was discontinued. Records of all of the NZ Forest Service 1:10,000 orthophotography are held by DOSLI.

THE LAND SURVEY SYSTEM

New Zealand enjoys the benefits of an integrated survey system that was introduced in 1876. This is achieved by :

- Relating every survey to one control system which provides the positional framework for all measurements.

- Standardising procedures, accuracies and records.

- Providing a single source of administration through DOSLI and servicing of the survey industry by a professional body.

Cadastral surveys are defined and governed by the Survey Regulations which are regularly reviewed to meet the changing needs of the land survey system and new technology. The two plan system (survey and title) is being maintained and retrieval of data is readily available through a microfilm system. With the ever increasing use of sophisticated technology in computers and measuring equipment, survey methods and standards are constantly under investigation. All new survey data approved is recorded. This forms the basis for the publication of cadastral maps. Approximately 20,000 plans are added each year to the land survey records of the department. These surveys are predominantly undertaken by registered surveyors in private practise.

TRIANGULATION AND CONTROL SURVEYS

During the period covered by this report there has been a reduction in control survey activities. Never the less a number of important surveys have been completed in various parts of the country. Notably Southland, Wairarapa, Taranaki and Waikato - Bay of Plenty. The triangulation surveys completed in this time have been largely confined to 3rd order densification and generally smaller in extent than in the past. Equipment such as the Wild DI-20, DI 3000, Rangemaster II and III plus the Wild T2 theodolite supplemented with the T3 have been used.

A major triangulation survey involving 35 stations over the Ross Island - McMurdo Sound - Dry Valleys region in Antarctica was completed. This was undertaken as a cooperative project with the U.S. Geological Survey (USGS) and included horizontal and vertical observations, EDM measurement, transit satellite observations, astronomical observations and tide gauge data. The resulting adjustment has defined the McMurdo Sound Geodetic Datum (1990), based on the WGS-84 spheroid.

The design of a geodetic records database and the transfer of all existing trig station and bench mark records from a manual system to a computerised database has been completed, involving 31,500 stations.

A small amount of precise levelling has been carried out in the 1987-90 period. The connection between Canterbury and Westland via Arthurs Pass and the Atiamuri - Putaruru section were completed. Work is proceeding between the Upper Wairau Valley and Hamner Springs. This job crosses several major alpine faults .

DOSLI purchased 6 dual frequency Global Positioning System (GPS) receivers (Ashtech XII) from 1989. These have been used with considerable success for photo control, cadastral control points, earth deformation studies and upgrading triangulation. The receivers have been deployed in the Antarctic where they were used for 1:50,000 mapping photo control.

Software has been developed and tested for kinematic GPS using helicopters and land vehicles. This enabled a 30 kilometre mean high water mark line to be measured in a single day.

Assistance has been provided for several international GPS campaigns. These were :

- Orbit determination pilot project (National Mapping, Australia, 1987).

- (CASA UNO) Central and South American GPS collaboration (NASA /JP - Jet Propulsion Laboratory, 1988).

- Global tracking experiment (JPL / U.S. National Geodetic Survey 1988).

- (APEX) Asia Pacific Experiment (NASA / JPL, 1989).

- A Co-operative International GPS Network (CIGNET) station was established in Wellington in 1990, and is operated by the department.

An analysis of historic records dating back to the turn of the century has shown a mean sea level rise of 1.8mm +/- 0.1 per year. This is now being confirmed elsewhere in the world. These gauges continue to be used for Sea Level Monitoring.

Two tide gauges have been established in the Ross Dependency Antarctica. Comparisons with a gauge at Scott Base established in 1958 indicated a mean sea level rise of 0.11mm +/- 0.08.

Negotiations are in progress with the U.S. National Oceanic and Atmospheric Administration (NOAA) over a proposal to establish two high accuracy tide recording stations in New Zealand as part of the Global Level of Sea Surface (GLOSS) programme. There is particular interest with respect to the southern ocean current.

TOPOGRAPHIC MAPPING

New Zealand has complete national coverage of "basic" topographic mapping. The published metric Infomap 260 series (1:50,000 with 20 metre contours) is available over the whole of the North Island and 66% of the South. Some of the older 1:63,360 imperial mapping is still being used until the 1:50,000 is complete in 1994. Of the 320 sheets covering New Zealand, 260 have been printed and published and the balance are in various stages of production.

Photogrammetric production of the Infomap 260 series is nearing completion. The mapping has been captured by both digital (6%) and graphical (94%) means at a scale of 1:25,000. Four sheets are combined and reduced to make one 1:50,000. These provide the base material for all derived topographic mapping and are available as another series in their own right. They are supplied in plan print form as either separate contour or detail sheets or as a composite.

Due to budgetary constraints revision of the 260 series has proceeded at a slower pace with six sheets being completed since 1975. More are planned for the next three years. Photogrammetry and field verification will be used in urban areas where large changes have occurred. Field methods alone will be employed in rural and undeveloped localities.

Other Infomap series which fully cover New Zealand are the Infomap 262 (1:250,000) and 242 (1:500,000). Full coverage of the imperial NZMS 1 (1:63360) is available but sheets are being withdrawn as they are superseded by the 1:50,000.

DOSLI undertakes a number of other major mapping activities. These include 12 sheets of 1:50,000 Antarctic mapping for the United States Geological Service, the production of a large number of cross sections and profiles as well as the

measurement of lower accuracy Crown forest cadastral boundaries by photogrammetric means.

A topographic data base of the 1: 250,000 series has been completed since the last UN Conference. Line drawings were scanned and converted into vector formats. The information has been structured into layers, networks and features. Attributes have been added to all features. Extra information such as local authority boundaries, power distribution transmission lines etc have been included. Further resource information may be added in the future. Full querying facilities are available.

Other small scale topographic data bases with different accuracies are under consideration. Some of the Pacific islands within New Zealand's administrative responsibility have been databased in the last three years. These include Tokelau, Cook, Campbell and Chathams Islands.

In 1988 GeoVision capture and edit stations were interfaced with analogue stereoplotters. Their task is to create a topographic data base, at a nominal scale of 1:500, of the physical locations of all ground features in Wellington City. The data is to be used for utility management purposes and town planning activities. Edit stations were also purchased to enhance the quality of data, add attribute information and form a seamless data base.

In the last three years 10% of the country has been covered by a 100m digital terrain model (DTM). These are predominantly located over the main communication routes through the North Island and the east coast of the South Island. Coverage is being extended as demand requires.

A number of applications have been developed for DTMs and digital topography. These range from perspective simulations to slope analysis. Digital mapping techniques have been applied to the measurement of historic buildings, as built plans of railway locomotives and the location of cracks in the beds of water storage reservoirs.

ORTHOPHOTOGRAPHY

Orthophotography is produced on a demand basis for government, local authorities and private sector clients. It is used for a number of purposes such as mining activities, flood control, city management, forestry and farming operations. Orthophotography is normally produced from DTMs as are any overlaid contours. A major new orthophoto product has been developed and will be produced as clients require. This will enable orthophoto images to be used as an information layer in a geographic information system.

AERIAL PHOTOGRAPHY

The departments ability to sequentially cover New Zealand with 1:25000 aerial photography has been reduced in recent years through financial limitations. However some key areas where only outdated photography was available have been reflown in conjunction with the map revision programme. The department maintains a National Photo Library which holds most Crown and some private copyright photography. This is becoming an increasingly valuable resource for historic comparisons of land use. A computerised aerial photo index system has been developed.

REMOTE SENSING

Software was purchased in 1989 to enable photogrammetric restitution from stereoscopic SPOT imagery. Promising results were obtained but there was a degree of uncertainty about the cost effectiveness in comparison with standard aerial photography. A number of tests have been carried out which include comparing a 100m DTM measured from SPOT with a corresponding one from aerial photos. Auto-matching techniques have also been tested.

Stereo SPOT imagery has been obtained over the Dry Valley region in Antarctica to extend the 1:50,000 50m contour mapping being undertaken for the United States Geological Service. Some technical difficulties are presently being encountered with the convergence of the orbits and the limitations of the analytical stereoplotter to compensate for them.

AERONAUTICAL CHARTS.

Separate publications are produced and maintained on a monthly basis according to civilian and military requirements for instrument, visual and military (RNZAF) chart supplements, also a South Pacific Flight Guide. The thrust towards integration and economical joint civil/military charting has continued.

Visual terminal and en-route charts at 1:250,000, 1:500,000 and 1:1,000,000 have been revised at eighteen month intervals. En-route and area charts have been revised at six month intervals. Plotting charts at scales of 1:1,000,000 and 1:2,000,000 (New Zealand) and 1:3000,000 and 1:6,000,000 (Pacific) are revised when required.

A specially designed series of 18 charts at 1:250,000 has been produced, based on the topographic map series of the same scale, for both civilian and military use.

The digital databank of aeronautical information is being maintained and is now an essential part of the totally automated production of aeronautical charts. Digital maps are generated and updated for radar control centres.

TOURIST AND RECREATIONAL MAPS

Thirty seven maps are currently produced showing National Parks, Forest Parks and tourist areas at scales of between 1:40,000 and 1:250,000. The Forest Park maps were previously produced by the now disbanded NZ Forest Service. The maps vary in format to suit the area of interest and to highlight recreational information.

RESOURCE MAPPING

This mapping was described in the 1984-87 report. Since then 170 land inventory maps at a scale of 1:100,000 have been printed. No further production is contemplated for the foreseeable future.

GENERAL PURPOSE AND SPECIAL MAPS

1:25,000 mapping of the South West Pacific and New Zealand's Sub-Antarctic Islands is continuing and will be completed as the preparatory work becomes available.

A series of climatic maps has been produced for the NZ Meteorological Service. The Robinson Projection is being used to produce a new map of the World. Nomenclature will be based on the donor principle.

CADASTRAL MAPPING

New Zealand has complete national coverage at a scale of 1: 50,000 as a complementary map to its topographical series at the same scale.

There is also complete large scale map coverage. These are known as Cadastral Record Maps and are produced at scales suited to the density of boundaries, appellation, area, subdivisional plan references and other relevant information. They are updated on a daily basis on approval of subdivisional plans required by statute to be submitted to the department for custody and guarantee of title definition. The record maps are drawn to a format which is a subdivision of the published 1:50,000 cadastral map series and are used in the production of that series as well as other cadastral themes on various published maps or products. Approximately 18,000 record maps are in use nationwide graphically representing 2,500,000 land parcels and associated descriptive information. Over 30,000 new land parcels are created each year which have also to be depicted.

In 1986 the department commenced the conversion of its cadastral record map series to digital form. Known as the DCDB (Digital Cadastral Data Base) its objectives are:

- to provide a spatial framework for LINZ (Land Information New Zealand) core developments.

- to provide an information system for use within the department with efficiencies in access, distribution and maintenance over existing manual systems.

- to provide integration with other related datasets and outputs for the LIS/GIS community.

To date (December 1990) 1066,000 parcel polygons or 42% percent of the estimated 2.5 million parcel polygons have been captured. Complete national coverage is planned for December 1992. The computer system is based on software by GeoVision of Canada resident on Digital Equipment corporation hardware.

ELECTORAL MAPPING

New Zealand also has complete national coverage of urban and rural Electoral Record Maps showing meshblock statutory and administrative boundaries. Meshblocks are the smallest geographic collection areas used for the Census of population and Dwellings and other surveys. Meshblock boundaries usually follow cadastral boundaries or physical features and form the basic building block of other statutory or administrative district boundaries such as those used for local body and national elections.

These maps are also presently being converted to digital form and will be marketed jointly by DOSLI and the Department of Statistics as a product called SAM (Socio-economic Area Mapping). By digitising the meshblocks and

integrating a wide range of statistical information held about each area, detailed socio-economic, demographic and market analysis can be derived.

To date 50% of the estimated 35,000 meshblock polygons have been converted. Completed national coverage is planned for November 1991.

A computerised textual Authoritative Streets and Places Index has been developed and is updated on a daily basis to support the above mapping and other Electoral activities.

OVERSEAS AID

New Zealand has a close and long standing involvement with its neighbour countries of the South Pacific and South East Asia. It has been active in many areas in providing survey and mapping aid to these countries through short and long term secondment of New Zealand personnel, training overseas staff within NZ and providing expertise for aid investigations. This support has continued at a high level for the last three years.

A pilot land information system has been demonstrated to the Government of Fiji. Further developments are likely in 1991. Discussions have been held with a government agency in the Solomon Islands to determine ways to improve their survey and mapping capabilities. A land titling surveyor is currently working in Nuie for a period of two years. The government of Western Samoa has been provided with an integration surveyor and a survey draughting officer since 1988. An extensive aerial survey of hurricane damaged areas was carried out during mid 1990.

Numerous international delegations have travelled to New Zealand in the last three years to gain a first hand look at the departments activities. These have included representatives from Thailand, the Philippines, Indonesia, Russia, Samoa, Fiji, Nuie, Vanuatu, China and many others.

PART II DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH (DSIR)

Considerable organisational change has taken place within DSIR since the last report to this conference in early 1987. The first with a major impact was the Government's requirements for departments such as DSIR to become more cost recoverable. To this end, Science Mapping Unit was required to be 100% cost recoverable from 1 April 1987, contracting for work both within DSIR and on the commercial market. There was no obligation on other DSIR divisions to use the Units' services. This requirement caused a halt in R & D work and a swing towards competition on the open market for scientific graphics, cartographic and photolithographic work.

Cost recovery has also had considerable impact on the number of maps being published by DSIR divisions. During the period, staff numbers have been allowed to decline by natural attrition from 22 to 10, to reflect the downturn in workflow. Geological, geophysical and oceanographic maps are still being published, although in less numbers than previously. However most geological maps are now drawn and printed in Australia, as SMU's level of overheads mean it cannot bid successfully for this type of work. Soil maps are no longer being published. Instead the information is being used to build a GIS of land resource data. The information will be sold to individual clients.

Many of the conventionally published maps during the period have been produced by computer generating the linework, marginal text and layout, and using conventional masking and photolithographic screening to prepare colour area infills. This method has saved the expensive of off site computer processing and assisted in keeping staff fully employed.

In April 1990, DSIR underwent a departmental wide restructure, resulting in the previous 23 divisions and 7 stand alone Units (such as SMU), being amalgamated into 10 major divisions. SMU became part of DSIR Land Resources, (along with the former Soils, Ecology and Botany divisions). The Unit was shifted from Wellington to the DSIR Taita campus (some 20 kilometres north of Wellington) in June 1990.

The mapping thrust of DSIR Land Resources is the building of a GIS to service client requirements in the wider land resource area. A considerable amount of expertise is available and the cartographers from SMU will be fully involved. Recently more use has been made of digital scanning for bulk data capture. When compared to hand digitising it has been found expedient to produce "clean" linework with technical pens on draughting foil, and have this copy scanned to produce computer files.

With the recent change of government in New Zealand, there has been another major change in Science policy. DSIR and other public sector science organisations will cease to be Departments of State. Instead research and development will be carried out by a yet to be determined number of Crown owned institutes which will come into being on 1 July 1992. These will concentrate on specific government funded priorities rather commercial, revenue earing tasks.

PART III : HYDROGRAPHIC ACTIVITIES

The area of operations for the Hydrographic Service of the Royal New Zealand Navy encompasses New Zealand's harbours and coastal waters, it's offshore islands and the surrounding coastal area. The latter includes that area of the South pacific in which New Zealand has a responsibility under bilateral charting arrangements with the United Kingdom/Australia and the International Organisation (IHO). Within this area it fulfils the following.

a) The conduct and quality control of hydrographic surveys for defence and charting purposes and the maintenance of the national hydrographic archives;

b) The production, quality assurance, correction, distribution and maintenance of stocks of navigational charts and publications;

c) The provision of Weekly and Annual Editions of Notices to Marines and promulgation of Long Range Navigation Warnings (for an Internationally agreed area of the South Pacific - NAVAREA XIV);

d) The provision of tidal data and maintenance of national tidal archives;

e) The collection and publication of random sounding data from international sources as part of the International Hydrographic Organisation's General Bathymetric Chart of the Oceans;

f) The recording and preparation of definitive charts showing base lines, territorial waters, fishing zones and exclusive economic zones;

The major survey unit is HMNZS MONOWAI (3900 tons displacement). This vessel has the full range of coastal and ocean surveying equipment, with automated data logging, plotting facilities, the capacity for the collection of selected geophysical data, coring current and temperature measurement and underwater photography.

Since the last conference MONOWAI has surveyed approximately half of a large area on the east coast of New Zealand the last area on this coast not yet surveyed by the RNZN and completed large scale surveys of Poverty Bay and Port Taranaki. A large scale survey of the Bay of Islands expected to take several years has been commenced in 1989 was to conduct a large scale survey at Aliepata on the SE coast of Western Samoa however persistent strong winds prevented work being progressed within the allotted time. A large scale survey of the northern shore of Rarotonga including Avatiu and Avarua Harbours was carried out in July 1990.

The two Inshore Survey Craft HMNZ Ships TARAPUNGA and TAKAPU (94 tons displacement) have completed some small surveys in the Haukaki Gulf and several surveys in the Marlborough Sounds. HMNZS TARAPUNGA carried out a sketch survey of the Kerikeri Inlet and river and assisted in the survey of Port Taranaki. Tarapunga's Officer in Command and leading Hydrographic Assistant carried out clearance surveys of two harbours and a hydrographic assessment of a third in Western Samoa in the wake of cyclone OFA.

A new Hydrographic Automated Data Logging and Processing System (HADLAPS) is being developed to replace the old HYDROPLOT system and will be fitted in the ship's boasts as well as in the ships themselves.

Chart production has centred around the reschemed 1:200,000 coastal series. A new chart of Cook Strait necessitated changes to limits of seven charts in the area from East Cape and Cape Egmont to Banks Peninsula. Improved coverage of the approaches to Otago Harbour has been achieved with the publication of a 1:100,000 chart. New Charts of New Zealand's sub-antartic islands are being compiled and new charts of the Cook Islands are planned. A New Zealand edition of INT 1 Symbols, Abbreviations, and Terms Used on charts originally produced by the Deutsches Hydrographisches Institut for the IHO has been published.

Two officers of the Royal Malaysian Navy have been given a six-month course in basic cartography another will receive training in early 1991.

The Notices to Mariners service has been maintained, expert advice has been provided to the Crown, Government Departments and the general public with respect to nautical charting, maritime boundary delimitation and other related professional matters.

New Zealand input to the IGOSS Sea Level Pilot Project has been maintained in addition to routine analysis predictions.